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## A COMPARISON OF UV SURFACE BRIGHTNESSES AND H I SURFACE DENSITIES FOR SPIRAL GALAXIES

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Shaya and Federman (1987) suggested that the ambient ultraviolet flux at 1000 Å permeating a spiral galaxy controls the H I surface density in the galaxy. They found that the atomic envelopes surrounding small molecular clouds, because of their great number, provide the major contribution to the H I surface density over the stellar disk. The increase in H I surface density with later Hubble types was ascribed to the stronger UV fields from more high-mass stars in later Hubble types. These hypotheses are based on the observations of nearby diffuse interstellar clouds, which show a sharp atomic-to-molecular transition (Savage *et al.* 1977), and on the theoretical framework introduced by Federman, Glassgold, and Kwan (1979). Atomic envelopes around interstellar clouds in the solar neighborhood arise when a steady state is reached between photodissociation of H<sub>2</sub> and the formation of H<sub>2</sub> on grains. The photodissociation process involves photons with wavelengths between 912 Å and 1108 Å.

Shaya and Federman used H-α flux as an approximate measure for the far UV flux and made their comparisons based on averages over Hubble type. Here, we compare, on an *individual* basis, UV data obtained with space-borne and balloon-borne instruments for galaxies with measurements of H I surface density (Warmels 1988a, b). Our comparisons substantiate the conclusion of Shaya and Federman that the far UV field controls the H I content of spiral galaxies.

The UV data come from measurements made with the OAO-2 satellite (Code and Welch 1982), the ANS satellite (Wessellius *et al.* 1982), a rocket flight (Smith and Cornett 1982), and the balloon payload SCAP 2000 (Donas *et al.* 1987). The primary wavelength bins are those at 1500 Å, 2000 Å, and 2500 Å. The ANS data at 1800 Å and 2200 Å are averaged to estimate the measured flux at 2000 Å. The UV data are corrected for inclination and aperture. No correction for internal extinction is applied to these data, because most of the galaxies in the sample are nearly face-on and because we are interested in the ambient flux.

For the largest galaxies in our sample, the satellite observations require a correction for the aperture. The OAO-2 data were acquired with a circular aperture of 10' diameter, and the ANS data were acquired with a 2.5' x 2.5' aperture. Our correction involves the ratio of D<sub>25</sub> to the aperture. A linear correspondence, with little dispersion, between different measurements exists, indicating that even the smallest aperture is larger than the scale length in surface brightness.

Comparisons with the ANS data are stressed because more galaxies with H I data are common to this set and because these comparisons are based on a homogeneous sample. Plots of H I surface density versus UV surface brightness will be presented. The correlation between these two parameters improves as shorter wavelengths are considered. With the assumption of a linear relationship, the correlation coefficients are r(2500) ~ 0.32, r(2000) ~ 0.39, r(1500)

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$\geq 0.46$ . Since  $H_2$  is destroyed by photons with  $\lambda \sim 1000 \text{ \AA}$ , the improved correlation with the shortest measurable wavelengths strengthens the conclusions of Shaya and Federman (1987). These results also show that the association between interstellar material and young stars in spiral galaxies is most discernible at ultraviolet wavelengths.

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